42-381 50 SHEETS EYE-EASE® - 5 SQUARES
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National® Brand

Review Calculus BC

1

$f(x) = \dfrac{1}{x+1}$ around $x = 1$

Force into $\dfrac{a}{1-r}$: $\dfrac{1}{1+(x-1)+1} = \dfrac{1}{2+(x-1)} = \dfrac{1}{2-[-(x-1)]}$

$= \dfrac{1/2}{1-\frac{1}{2}[-(x-1)]} = \dfrac{1/2}{1-[(-1/2)(x-1)]}$ $\quad a = 1/2$, $r = (\frac{-1}{2})(x-1)$

$\sum \frac{1}{2}\left(-\frac{1}{2}\right)^n (x-1)^n$ OR $\sum_{n=0}^{\infty} (-1)^n \left(\frac{1}{2}\right)\left(\frac{x-1}{2}\right)^n$

b) radius of Convergence : $\left|\dfrac{x-1}{2}\right| < 1$ $\quad |x-1| < 2$

$R = 2$

$-2 < x-1 < 2$

$-1 < x < 3$

Interval of Convergence

Geometric
Endpoints Do not work

c) $\frac{1}{2} - \frac{x-1}{4} + \frac{(x-1)^2}{8} - \frac{(x-1)^3}{16} \Big|_{x=.5} =$

2 $\sum \dfrac{nx^n}{2^n}$ $\quad \lim_{n\to\infty}\left|\dfrac{(n+1)x^{n+1}}{2^{n+1}} \cdot \dfrac{2^n}{nx^n}\right| = \left|\dfrac{x}{2}\right| \lim_{n\to\infty}\left(\dfrac{n+1}{n}\right) = \left|\dfrac{x}{2}\right| < 1$

$\left|\frac{x}{2}\right| < 1 \Rightarrow |x| < 2 \quad -2 < x < 2$

Endpoints : $x = -2$ $\quad \sum \dfrac{n(-2)^n}{2^n} = \sum \dfrac{n(-1)^n \cdot 2^n}{2^n} = (-1)^n \cdot n$ Diverges n^{th} term

$x = 2$ $\quad \sum n$ Diverges n^{th} term

(2b on back page)

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3) a) $L(x) = -1 + 2x$

b) $P_2(x) = -1 + 2x - \frac{3x^2}{2!}$

c) $P_3(x) = -1 + 2x - \frac{3x^2}{2!} + \frac{4x^3}{3!}$ at $x = .1$ $= -.106\overline{3}$

4) $\sum \frac{\pi^n}{e^{2n}} = \frac{\pi^n}{(e^2)^n} = \sum_{n=0}^{\infty}\left(\frac{\pi}{e^2}\right)^n$ Sum $= \frac{1}{1-\left(\frac{\pi}{e^2}\right)} = 1.7396$

5) $f(x) = \sum 2\left(\frac{(x+2)}{3}\right)^n$ Geometric so $a = 2$ $r = \frac{x+2}{3}$

$-1 < \frac{x+2}{3} < 1$ $\quad -3 < x+2 < 3$

$\boxed{-5 < x < 1}$ Endpoints Do not work because series is geometric

b) $\frac{2}{1-\frac{(x+2)}{3}} = \frac{2}{\frac{3-x-2}{3}} = \frac{2}{\frac{1-x}{3}} = \frac{6}{1-x}$

6. $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \sum_{n=0}^{\infty} \frac{x^n}{n!}$ ← n=0

$e^x - 1 = x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \sum_{n=1}^{\infty} \frac{x^n}{n!}$ ← n=1

$\frac{e^x-1}{x} = 1 + \frac{x}{2!} + \frac{x^2}{3!} + \cdots + \sum_{n=1}^{\infty} \frac{x^{n-1}}{n!}$

$\int \frac{e^x-1}{x} = x + \frac{x^2}{2 \cdot 2!} + \frac{x^3}{3 \cdot 3!} + \cdots + \sum \frac{x^n}{n \cdot n!}$

(7) $\sum \frac{(-1)^n}{\sqrt[3]{n}+2n}$

To converge absolutely ... $\sum \frac{1}{\sqrt[3]{n}+2n}$ must converge.

but this series diverges by the Integral Test

so it is Conditionally convergent.

2b) when $x=-1$ $f(x)=\sum_{n=0}^{\infty} n\left(\frac{-1}{2}\right)^n$

$f(x) = -\frac{1}{2} + \frac{2}{4} - \frac{3}{8} + \frac{4}{16} - \frac{5}{2^5} + \frac{6}{2^6} - \frac{7}{2^7} + \frac{8}{2^8} - \frac{9}{2^9}$

the next term gives the maximum error for an alternating Series

10^{th} term is $\frac{10}{2^{10}} < .01$